



Project Status Report for: January 2001

Project Title: Ultra Low NO_x Integrated System for Coal-Fired Power Plants

Project Number: 91890460 **Project Manager:** John Marion

Customer Name: U.S. DOE / Performance Projects **Project Leader:** Charles Maney

GOALS AND OBJECTIVES:

Develop low cost, retrofit NO_x control technologies to address current and anticipated, near term emissions control legislation for existing coal fired utility boilers. Specific goals include:

- Achieve < 0.15 lb/MMBtu NO_x for eastern bituminous coals
- Achieve < 0.10 lb/MMBtu NO_x for western sub-bituminous or lignitic coals
- Achieve economics at least 25% less than SCR-only technology
- Validate NO_x control technology through large (15 MWt) pilot scale demonstration
- Evaluate the engineering feasibility and economics for representative plant cases
- Provide input to develop commercial guidelines for specified equipment
- Provide input to develop a commercialization plan for the resultant technologies

WORK PLANNED FROM PREVIOUS REPORT:

Task 3.1 – Test Planning & Facility Preparation

- Generate preliminary test matrix for the second period of combustion testing in BSF.
- Finalize detailed list of tasks required to prepare BSF for next combustion test period.
- Select fuel(s) for use during the 2nd combustion test period in the BSF and begin the procurement process.

Task 3.5 – Data Reduction and Analysis

- Complete the data reduction and analysis from the first combustion test period.
- Generate graphics and summarize the test results in preparation for internal (ALSTOM Power) and external (DOE NETL / Advisory Panel) presentation and review during second Advisory Panel meeting.

Task 6 – Advisory Panel

- Hold a second meeting of the Advisory Panel on Wednesday, January 31, 2001 at ALSTOM Power's Windsor, Connecticut site.

Task 8 – Project Management

- Resolve scope and schedule issues with ALSTOM Power and DOE NETL personnel.



ACCOMPLISHMENTS FOR REPORTING PERIOD:

Task 2.4 – Advanced Control System Design

A set of 12 mass flow meters was used in the recent BSF testing to measure, and allow for control over the coal flow rate to each of the 12 coal nozzles (3 elevations x 4 corners). As these devices were received immediately prior to the BSF testing, no attempt was made to calibrate them prior to their use. As a result, steps were taken in January to prepare for their calibration including fabrication of a set of 12 barrels with bag filters for connection to each coal line to allow the coal flow rates to be determined by weighing the barrels. It is expected that verification testing of the coal flow meters will occur prior to the next BSF test campaign as a sufficient quantity of pulverized coal becomes available.

Task 3.1 – Test Planning & Facility Preparation

- *Generate preliminary test matrix for the second period of combustion testing in BSF.*

A preliminary test matrix was generated for the second period of combustion testing in the BSF. The main variables that will be examined in the testing are listed in Table 1. The noted variables largely represent the extension of the test work performed in October where performance will be evaluated on a more reactive fuel. In addition to the variables listed, however, one to two additional, new ideas for further NO_x reduction will also be evaluated.

Table 1. List of variables to be tested in week 2 of BSF testing.

- | | |
|-----------|--|
| 1 | MBZ Stoichiometry |
| 2 | Staged Residence Time |
| 3 | Transport Air to Fuel Ratio |
| 4 | Transport Air & Fuel Flow Balance |
| 5 | SOFA Elevation |
| 6 | SOFA Velocity (<i>field equivalent</i>) |
| 7 | SOFA Yaw |
| 8 | Subcompartmentalization |
| 10 | Boiler Load |
| 11 | Coal Fineness |
| 12 | Excess Air |
| 13 | Bottom End Air |
| 14 | Other ideas, not yet finalized |

- *Finalize detailed list of tasks required to prepare BSF for next combustion test period.*

A list of the tasks required to prepare the BSF for the next combustion test period was also completed in January. However, all project related facility preparations were on hold pending presentation of the first test period results to the advisory panel members, and subsequent agreement on the scope of work for performance during the second BSF test campaign. It is expected that preparation work for the second BSF test period will begin in February.

- *Select fuel(s) for use during the 2nd combustion test period in the BSF and begin the procurement process*



A sub-bituminous coal from the Powder River Basin was selected to fire in the second test period in the BSF. Arrangements for procurement and shipping of this coal are currently being made with the coal company. A high volatile Eastern bituminous coal has also been selected to fire in the second test period in the BSF. Arrangements to procure the bituminous coal will be made in February.

Preliminary analyses of the noted week two test coals, and the mVb coal fired during the week 1 work are provided in Table 2.

Table 2. BSF Test Coal Analyses

	mvb	hvBb	sub-bit
<u>Proximate</u>			
VM	22.5	34.5	31.1
FC	63.1	52.0	37.4
FC/VM	2.8	1.5	1.2
<u>Ultimate</u>			
Moisture	0.9	4.0	26.1
Hydrogen	4.0	4.7	3.6
Carbon	74.7	70.4	51.2
Sulfur	1.4	2.4	0.3
Nitrogen	1.3	1.4	0.8
Oxygen	4.2	7.6	12.5
Ash	13.6	9.5	5.5
Total	100.0	100.0	100.0
HHV, BTU/lb	13,109	12,624	8,750
lb N / MMbtu	1.0	1.1	0.9
O / N	3.2	5.4	15.6

Task 3.5 – Data Reduction and Analysis

- Complete the data reduction and analysis from the first combustion test period.
- Generate graphics and summarize the test results in preparation for internal (ALSTOM Power) and external (DOE NETL / Advisory Panel) presentation and review during second Advisory Panel meeting.

Data reduction and analysis associated with the testing of a medium volatile bituminous coal in ALSTOM Power's Boiler Simulation Facility (BSF) during the periods of October 29 through November 3, 2000 and November 13 through November 14, 2000 has been completed. Results were presented at internal (ALSTOM Power) and external (DOE NETL / Advisory Panel) review meetings in January, 2001. Week 1 combustion test results will be published along with the week 2 and related project task results in the final report upon completion of the project work.

Task 6 – Advisory Panel

- Hold a second meeting of the Advisory Panel on Wednesday, January 31, 2001 at ALSTOM Power's Windsor, Connecticut site.



A second meeting of the Utility Advisory Panel was held Wednesday, January 31, 2001 at ALSTOM Power's Windsor, CT site. Attendees to the meeting included:

Janos Beér	Massachusetts Institute of Technology
Gary Camody	Alstom Power Performance Projects
Doug Hart	Alstom Power Performance Projects
Bob Hilton	Alstom Power Environmental Systems
Bill Hocking	Alstom Power U.S. Power Plant Laboratories
Charles Maney	Alstom Power U.S. Power Plant Laboratories
John Marion	Alstom Power U.S. Power Plant Laboratories
Chad Peterson	Scottish Power (PacifiCorp)
Jerry Piskowski	Indianapolis Power & Light
Scott Renninger	US Department of Energy, National Energy Technology Laboratories
Galen Richards	Alstom Power U.S. Power Plant Laboratories
Chris Smith	Alstom Power Performance Projects
James Topper	Consumers Energy
Jerry Urbas	Reliant Energy

The meeting included a brief overview of the project work, and the current (overall) status. In addition, a presentation of the results from the first week of BSF combustion testing on the medium volatile bituminous coal, a review of the preliminary engineering and economic analysis, and a discussion of the remaining project scope was made. Minutes from the second advisory panel meeting are contained in an MS Word document entitled "MeetingMinutesUAP_2.doc" that will be distributed with this report.

Task 8 – Project Management

- *Resolve scope and schedule issues with ALSTOM Power and DOE NETL personnel.*

Internal meetings were held with the project team to reconcile the remaining project budget and scope. The recommendations of the project team were reviewed by ALSTOM Power personnel and presented to DOE NETL for approval. Based on these discussions, small modifications to the overall project work scope, were made and agreed to with the net result that the project is now on-budget for the scope of work performed. A revised project statement of work reflecting the agreed to project scope modifications will be transmitted to ALSTOM Power and US DOE personnel in February.

In addition, a technical paper entitled "Ultra-Low NOx Integrated System for Coal Fired Power Plants was written and submitted to the 28th International Technical Conference on Coal Utilization & Fuel Systems to be held in Clearwater, FL on March 5-8, 2001. The paper describes ALSTOM Power, Inc.'s experience implementing low-NOx retrofits of T-fired utility boilers and the development efforts of this project to further reduce NOx emissions in coal-fired utility boilers.

Lastly, pursuant to a memo received from Ms. Donna Jaskolka, Contract Specialist, US DOE NETL on January 24, 2001, Mr. Scott Renninger of US DOE NETL, Morgantown has been named as the Contracting Officer's Representative (COR) for this project. As COR, Scott is responsible for (among other things) assisting with the administration of the project award, supervising the technical progress, and recommending changes to the project scope of work to the Contracting Officer, Mr. Richard Rogus for approval.



WORK PLANNED FOR NEXT REPORTING PERIOD:

Task 2.4 – Advanced Control System Design

- Complete preparations for the calibration / testing of coal mass flow meters.
- Begin analysis of the advanced flame scanner data.

Task 3.1 – Test Planning & Facility Preparation

- Purchase fuels for 2nd BSF test week.
- Begin general BSF facility prep.
- Finalize selection of additional NO_x reduction concepts and begin engineering / procurement.